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ABSTRACT

This study tested the Adult Distance Study through Computer Conferencing (ADSCC) model developed by D. Eastmond (1994) to determine if learner readiness, online features, and computer mediated communication (CMC)-related learning approaches are associated with learner satisfaction in an academic computer conference. Participants were 50 students from 5 universities who participated in an inter-university virtual conference and completed the research instrument. All three variables were correlated with learner satisfaction, and online features emerged as the best predictor of learner satisfaction. Results indicate interrelationships between the three variables. The ADSCC model was a good predictor of learner satisfaction, and it provided a useful framework for understanding learner satisfaction by showing how to categorize the different components that influence satisfaction in an academic computer conference. The study also examined learner profiles for those who were more satisfied and less satisfied with the computer conference. (Contains 4 tables and 22 references.) (Author/SLD)

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WHICH LEARNER READINESS FACTORS, ONLINE FEATURES, AND CMC RELATED LEARNING APPROACHES ARE ASSOCIATED WITH LEARNER SATISFACTION IN COMPUTER CONFERENCES?

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ABSTRACT

This study tested the Adult Distance Study Through Computer Conferencing (ADSCC) model developed by Eastmond (1994), to determine if learner readiness, online features, and CMC-related learning approaches are associated with learner satisfaction in an academic computer conference. All three variables were correlated with learner satisfaction and online features emerged as the best predictor of learner satisfaction. Results indicate interrelationships between the three variables. The ADSCC model was a good predictor of learner satisfaction. It provided a useful framework for understanding learner satisfaction by showing how to categorize the different components that influence satisfaction in an academic computer conference. The study also examined learner profiles for those who were more satisfied and less satisfied with the computer conference.

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INTRODUCTION

With the rapid growth of the Internet, the World Wide Web is increasingly being used as a medium to deliver distance education at the post-secondary level. An examination of a significant number of web-based courses for adult learners indicates that they are predominantly designed to transmit information to the learner rather than foster the teaching and learning process in a dialogic manner, a view supported by Boshier et al. (1997). Computer conferencing (CC) is the vehicle that can facilitate the dialog and interaction necessary for the teaching and learning process in web-based courses by providing opportunities to negotiate meaning, validate knowledge, and construct knowledge through social negotiation. CC can also facilitate a collaborative, nurturing, and supportive learning environment for learners who are separated by geographic distance. While research on the use of CC for distance teaching and learning has advanced in the last decade, questions related to learner variables and the unique aspects of the computer-mediated communication (CMC) environment still remain. Questions that need to be examined, and which sparked our interest as we approached this study were: Which learner characteristics and pre-requisite skills are related to learner satisfaction with a CMC learning environment? Which characteristics of the online environment contribute to, or detract from the learner's sense of satisfaction? What are the unique learning approaches learners adopt when functioning in the CMC environment? Which of these learning approaches are associated with satisfaction? Which learner profiles are associated with more or less satisfaction in CC? We believe that it is important to examine these questions as instructional designs must account for the complex interrelationships between the learning task, media attributes and the learner's cognitive and affective processes.

A review of research related to learner characteristics and CMC variables published in refereed distance education journals in the past six years revealed few articles analyzing learner experiences with computer conferencing: learner perspectives (Burge 1994; Eastmond 1994); critical thinking (Bullen 1998); group dynamics (McDonald and Gibson 1998); equity of access (Ross, Crane and Robertson 1995); and practice-based reflection (Naidu 1997). Of these, we found three studies (Burge 1994; Bullen 1998; Eastmond 1994), that investigated the relationship between learner characteristics and the unique aspects of the online environment. Burge (1994) explored the salient features of the CMC environment and the effects of these features on learning from the learners' perspective. Bullen (1998) noted that the factors most frequently identified by students as either facilitating or inhibiting their participation and critical thinking in online discussions were those related to the attributes of computer conferencing technology, described by Harasim (1990) as time-independence, text-based communication, computer-mediated communication, and many-to-many communication. Eastmond (1994) examined adult student perspectives of distance study by computer conferencing and developed a model to guide the understanding of student experiences with the CMC medium. We found this model to be a useful framework for our study.

THEORETICAL FRAMEWORK

Employing grounded theory, and the constant comparative model for qualitative research (Glaser and Strauss 1967), Eastmond (1994) examined adult students' experience of learning in an on-line course. Then, using data from various dimensions of the study, Eastmond (1994) developed the Adult Distance Study Through Computer Conferencing (ADSCC) model as a framework from

which to understand the dynamics of successful learning by computer conferencing. Surrounding the model is the context within which the computer conference is held and the larger institutional and societal milieu that influences the distance learning experience. Within this context there are three major aspects which sequentially influence the student's study experience: (a) readiness -- the personal and environmental factors that prepare the student for study in this instructional situation; (b) online features -- the unique elements that make up the computer conferencing environment; and (c) learning approaches -- the general and specific learning strategies a student uses to make the conference an effective learning experience. Eastmond notes that the educational institution can positively impact readiness, online features, and learning approaches. The individual also can improve each dimension iteratively as the person uses new knowledge about learning approaches or online features to enhance readiness or elements of the online environment. We found this model to be a useful starting point for our research. We wanted to test the ADSCC model which was developed using grounded theory principles by employing a quantitative approach to data analysis in our study. The three major aspects of the Eastmond (1994) ADSCC model: learner readiness, online features, and CMC-related learning approaches were selected as three independent variables and adapted for our study. Our adaptation of the model is seen in Figure 1.

Insert Figure 1 about here

Learner readiness

As Eastmond (1994) observes readiness relates to the various personal factors a distance student brings to the learning equation which influence its success. These include learning preferences, style, array of learning strategies, prior learning experiences, computer skills, and interest in the course content. Harasim, Hiltz, Teles and Turoff (1995) add learner attitudes, motivation, and self-discipline. As seen in Figure 1, the learner readiness variable adapted for our study was composed of the following seven learner readiness dimensions: (1) Prior e-mail experience; (2) prior listserv experience; (3) prior comfort with CMC; (4) adequate technical training at site; (5) self-efficacy in mastering the CMC system; (6) belief in CMC's potential for distance education; and (7) belief in the medium's capacity for academic discussions.

Online features

Awareness of online features is preparatory to fitting oneself within the online environment (Eastmond 1994). Students need to become aware of how characteristics of the online environment affect participation in discussions, group dynamics, learning and satisfaction. Some of these characteristics include: asynchronicity, multiple simultaneous discussion, information overload, interactivity, communication anxiety, social cohesion, group dynamics, miscommunication, equal opportunity to participate, and technical problems (Eastmond 1994; Gunawardena 1998; Harasim, Hiltz, Teles, and Turoff 1995). As shown in Figure 1, the online features variable adapted for our study included the following seven online features: (1) CMC as a medium for social interaction; (2) comfort interacting with online participants; (3) social cohesion of the online group; (4) the importance of having one's point of view acknowledged by other participants (point of view acknowledged); (5) the listserv's capability to facilitate discussion; (6) barriers due to technical problems; and (7) barriers due to access.

CMC-related learning approaches

Eastmond (1994) notes that many learning approaches relate specifically to the computer conferencing medium itself--such elements as: learning technical procedures to participate effectively online; processing online information, deciding when to contribute and how best to present one's thoughts on-line; etc. Our adaptation of the CMC-related learning approaches variable indicated in Figure 1, incorporates the following learning approaches associated with the CMC environment: (1) Actively contributing to the conference; (2) comfort participating in discussions; (3) comfort conversing through text-based medium; (4) comfort introducing self in CMC; (5) forming a sense of the online community through introductions; (6) ability to form distinct impressions of participants; and (7) using emoticons to communicate feelings.

In trying to develop the conceptual framework for our study using the Eastmond (1994) model, one of the difficulties we encountered was determining within which variable an item would fit as some items related to both the online features variable and the CMC-related learning approaches variable. Noting this inter-relationship, Eastmond observes that readiness precedes the experiencing of on-line features--the perception of which allow students to create effective learning strategy responses. It should be kept in mind that the three online processes are interactive.

RESEARCH QUESTIONS AND CONTEXT

This paper reports on the second phase of a study that was undertaken to determine the variables associated with learner satisfaction in computer conferences. The first phase, reported in Gunawardena and Zittle (1997), used a regression model to examine how effective "social presence" is as a predictor of overall learner satisfaction in a text-based medium. The analysis was

based on the GlobalEd inter-university computer conference. In the second phase of the study, the same conference was used to test the adapted framework of the Eastmond (1994) ADSCC model seen in Figure 1 to determine if learner readiness, online features, and CMC- related learning approaches are related to learner satisfaction in computer conferences. While the Eastmond (1994) ADSCC model was developed as a framework for examining student learning in computer conferences, we were interested in determining factors associated with student satisfaction. We, therefore, adapted this model to examine learner satisfaction with an academic computer conference. We have been interested in studying learner satisfaction because computer conferences, even though they are set up as academic exercises, are social environments (Feenberg and Bellman 1990; Harasim 1993; Spears and Lea 1992: Walther 1992) in which a strong affective component resides. If learners are satisfied with computer- mediated learning experiences, they are more likely to enroll in such experiences again. Therefore, the focus of our interest was in examining the variables associated with learner satisfaction.

The purpose of this study was to determine if the three variables in the Eastmond (1994) ADSCC model: learner readiness, online feature, and CMC-related learning approaches, are: (i) related to learner satisfaction; (ii) intercorrelated; (iii) able to predict learner satisfaction with an academic computer conference,and (iv) useful in developing a profile of differences in learner satisfaction. The research questions for this study stated below were developed using the adaptation of the Eastmond (1994) ADSCC model seen in Figure 1

1. Is there a relationship between learner readiness (described in Figure 1) and learner satisfaction with an academic computer conference?

2. Is there a relationship between online features (described in Figure 1) and learner satisfaction with an academic computer conference?

3. Is there a relationship between CMC-related learning approaches (described in Figure 1) and learner satisfaction with an academic computer conference?

4. What are the intercorrelations between learner readiness, online features, and CMC-related learning approaches?

5. Which of the three independent variables: learner readiness; online features; and CMC-related learning approaches, can best predict the dependent variable, learner satisfaction with an academic computer conference?

6. Which type of overall learner profile emerges for those who are more satisfied or less satisfied with academic computer conferences?

The study is based on the Fall 1993 inter-university "GlobalEd" CC that provided a forum for graduate students in distance education to share and discuss research and experience distance education by using CMC. GlobalEd was premised upon a learner-centered collaborative learning paradigm where the learner would be an active participant in the learning process involved in constructing knowledge through a process of interaction and discussion with learning peers and instructors. Graduate classes in six universities (San Diego State University, Texas A&M University, University of New Mexico, University of Oklahoma, University of Wisconsin-Madison, the University of Wyoming) were major participants and moderated the student discussions on GlobalEd. A few interested students and faculty in two other universities (Pennsylvania State University and the University of Wollongong in Australia) also participated. GlobalEd had approximately 90 participants and generated 892 messages. GlobalEd was designed as a virtual class that extended the traditional on-campus classes. However, two classes that participated in GlobalEd were taught entirely at a distance, Texas A&M, through a compressed video system, and the University of Wisconsin-Madison via computer conferencing. The

University of New Mexico was the overall moderator of the conference and maintained the "listserv" (the electronic distribution list) that connected students from different institutions.

The GlobalEd conference was an academic exercise that was a class requirement at each participating university and ran the length of the semester. Graduate students in distance education at each university were responsible for (a) conducting a research project, (b) sharing these results with the GlobalEd participants, (c) moderating the discussion on the research project for one week, and (d) contributing to the discussions. This project is described in detail in Gunawardena et al. (1994) and Murphy et al. (1995).

METHOD

Participants

The participants of this study were fifty students from five universities: San Diego State (N=8), Texas A & M (N=11), University of New Mexico (N=14), University of Wisconsin-Madison (N=7), and University of Wyoming (N=10), who participated in the Fall 1993 GlobalEd inter-university virtual conference and completed the research instrument. Students from the University of Oklahoma did not participate in the study. Demographically, 62% were females, and the mean age was 40 years. Responses to ethnic affiliation indicated that about 88% of the respondents were Caucasian, 6% Hispanic, and 2% Native American. Four percent did not respond to the demographic questions. In relation to technical experience with the system, about 50% of the respondents had used e-mail, and 22% had participated in a Listserv discussion prior to the conference. When asked how comfortable they were with CMC prior to GlobalEd, roughly 44% responded that they were comfortable with the technology while 42% responded in the negative, 10% were uncertain, and 4% did not respond.

Procedure

After culmination of the conference participants completed the 61-item questionnaire that was developed by Gunawardena to research and evaluate the GlobalEd conference. The paper and pencil questionnaire was administered at each institution by the faculty member responsible for the GlobalEd project and data collected and entered into a database at the University of New Mexico and shared with participating faculty. Although the data was collected in 1993 and the first study from this data was published in 1997 (Gunawardena and Zittle, 1997), we feel that this data set is still valid for the questions we wanted to examine in the present study.

Instrumentation

The GlobalEd Questionnaire was developed to assess participants' responses to CMC, the GlobalEd experience, and areas of theoretical interest that have been identified in the literature (Harasim 1993; Hiltz 1994) as potential influences on CMC satisfaction. In order to examine the five research questions, 31 five point Likert-scale items from the 61-item questionnaire were selected. The Likert-scale items (1= Strongly Disagree, 2= Disagree, 3= Uncertain, 4= Agree, and 5= Strongly Agree) were constructed to assess self report measures of satisfaction, and variables related to learner readiness, online features, and CMC-related learning approaches. Figure 1 describes the questionnaire items that were included in the learner readiness scale, the online features scale, and the CMC-related learning approaches scale. Figure 2 shows the questionnaire items that comprised the learner satisfaction scale. Internal consistency reliability of each multi-item scale was assessed using Cronbach's coefficient alpha. Table 1 displays the Cronbach's coefficient alpha for the four scales showing that all scales have fairly good reliability. Of the three independent variables, the best reliability was observed for the learning approaches scale, followed

by online features, and learner readiness. The learner readiness scale which consisted of seven questionnaire items embodied the concept of learner readiness described in the Eastmond (1994) ADSCC model as various personal factors that a student brings to the learning equation which influence its success. The seven item online features scale was based on the ADSCC model's description of the characteristics of the online environment which influence participation and group dynamics. The CMC-related learning approaches scale included seven items adapted from the ADSCC model that describe learning approaches specifically related to the computer conferencing medium itself. Learner satisfaction with the academic computer conference was measured by a ten-item scale, which showed very good reliability (Table 1). The learner satisfaction scale (Figure 2) sought student perspectives on their ability to learn through the medium of CMC and GlobalEd discussions, the value of the conference as a learning experience, motivation to do additional research on topics discussed, and motivation to participate in a similar conference in the future.

Insert Figure 2 about here

Insert Table 1 about here

Data analysis

To examine the first research question which sought to determine if there was a relationship between learner readiness and learner satisfaction with an academic computer conference, a Pearson product-moment correlation coefficient was computed. The value of r obtained from this analysis gives information about both the strength and the direction of the relationship between the two variables. The second and third research questions were examined by the same type of analysis as the first question. In order to examine the fourth research question, a correlational analysis was done to examine the relationship between each of the scales, learner readiness, online features, and CMC-related learning approaches. A regression model was developed in order to examine the fifth research question: Which of the three independent variables: learner readiness; online features; and CMC-related learning approaches, can best predict the dependent variable, learner satisfaction with an academic computer conference? The type of regression equation used was linear regression with forced simultaneous entry of all three independent variables. Because regression models are sensitive to missing data on subjects who have either not answered an item, or who have selected the "not applicable" category, we decided to be very conservative with the subjects we included in our regression analysis. For our regression equation, we included only those subjects who had answered 80% and above of all the items in each of the scales. This procedure brought down the sample size to 41 subjects for the regression analysis. While we would have preferred to have a larger sample size to test the regression model, we felt it was prudent to be conservative in our analysis. Data was analyzed using the Statistical Package for Social Sciences (SPSS) 7.5 software.

In order to examine the sixth research question, two types of analyses were done. One, was a quantitative analysis based on a new satisfaction variable, which included only three items of the former ten item scale, and the other was a qualitative analysis of three open-ended questions in the

questionnaire. For the quantitative analysis, the participants were divided into two groups based on their satisfaction with the conference. Those indicating high satisfaction were labeled the High Satisfaction Group (HSG), and those indicating low satisfaction were labeled the Low Satisfaction Group (LSG). The criteria for division into the two groups was the average score a participant received on three "satisfaction" items which comprised a new satisfaction variable including the following three questionnaire items: #50-As a result of my experience with GlobalEd, I would like to participate in another computer conference in the future; #51-GlobalEd was a useful learning experience; and #52-Projects like GlobalEd enhance face-to-face on campus courses.

Participants scoring 4 and above on the 5 point Likert scale (which indicated agreement - 4, or strong agreement - 5) were classified as the High Satisfaction Group (HSG). Those scoring between 1-3 on the Likert scale (which indicated strong disagreement - 1, disagreement - 2, or uncertainty - 3) were classified as the Low Satisfaction Group (LSG). This classification was then used to determine if there was a significant difference between the two groups and the variables of research interest related to (1) learner readiness, (2) online features, and (3) CMC-related learning approaches. Two subjects were dropped from this study because of incomplete responses to the three questionnaire items. Therefore, the total number of subjects for this analysis was reduced to 48. There were 26 participants in the HSG and 22 in the LSG. The High Satisfaction Group and the Low Satisfaction Group were compared with each of the variables: learner readiness, online features, and cmc-related learning approaches. using a two-tailed t-test. We also analyzed responses to the demographic questions in the questionnaire by High Satisfaction Group and Low Satisfaction Group. In examining demographic data, we found that the mean age of the HSG was 41 years and the mean age of the LSG was 38. The HSG was composed of 39% males and 62% females. The LSG was composed of 41% males and 59% females. There were 56% full time

students in the HSG, and 46% full time students in the LSG. Participants were asked to state their preferences for the study environment, whether they preferred to study alone or in a group. In the HSG, 69% of the participants preferred to study alone while 90% of the LSG participants preferred to study alone.

In the qualitative analysis to answer the sixth research question, three open-ended questions in the GlobalEd questionnaire were used. The open ended questions asked: What did you learn from GlobalEd? If you would like to change one thing about GlobalEd, what would it be? If you would like to keep one thing about GlobalEd, what would it be? Analysis of this data employing the qualitative research technique of content analysis (Guba & Lincoln, 1981) led to the development of learner profiles. A purposive sample of 10 participants representing each of the universities was selected for this qualitative analysis. Criteria for selection included participants from both the High Satisfaction and Low Satisfaction Groups, males and females, and a range of ages (23-55 years).

RESULTS AND DISCUSSION

Table 2 displays the results for research questions 1, 2, and 3, showing the Pearson Product Moment Correlation coefficients and the significance levels. In examining the first research question, we observe from Table 2 a moderate, positive correlation between learner readiness and satisfaction, which was statistically significant ($r = .27$, $p<.05$). This indicates that participants who felt more positively about their readiness to participate in an academic computer conference were more satisfied with the conference. As learner readiness increases, so does satisfaction with the

learning experience. Therefore those participants who had more experience with the technical system, received training at their sites, felt more comfortable with the medium, had a more positive attitude toward the potential of the medium, and had a greater sense of self-efficacy in being able to master the CMC system, were more likely to be satisfied with an academic computer conference. This shows the importance of paying attention to learner readiness factors as we design computer conferences. In many instances, adult learners may not be ready to participate in learning experiences in a mediated environment. Paying close attention to the attitudes and skills they bring with them, and orienting them to the skills they need to function effectively in an online environment, will help ensure a more satisfying learning experience.

Insert Table 2 about here

In examining the t-test results which investigated if there was a difference between the high and low satisfaction groups in relation to learner readiness, the results indicate that there was a significant difference between the HSG and LSG in two areas, prior listserv experience (t=3.484, df=41, M diff=1.530, p<.005), and attitude or beliefs toward the medium of CMC (t=3.058, df=32, M diff =.608, p<.005). The HSG had more experience participating in listserv discussions prior to GlobalEd. The HSG also had a more positive attitude toward CMC's potential as a medium for distance education and as a medium for academic discussions.

The second research question examined whether there was a relationship between online features and learner satisfaction with an academic computer conference. Results in Table 2 indicate a very significant, high positive correlation between online features and learner satisfaction, (r =

.59, p<.01). Learners who understood the unique characteristics of the online learning environment and felt comfortable participating in a virtual learning experience were more likely to be satisfied with the academic computer conference. Their understanding of online features included their perception of CMC as a medium for social interaction , their level of comfort interacting with virtual participants, being acknowledged by other participants for their contribution to the conference, and their perception of the strengths and weaknesses of the technical system to facilitate an academic discussion. The strong association between online features and learner satisfaction indicates the importance of orienting adult learners to the unique characteristics of the online learning environment including both its technical and social nature, and providing guidance on how to effectively communicate through this medium.

In examining the t-test results which investigated if there was a difference between the high and low satisfaction groups in relation to online features, results indicate that there was a significant difference between the HSG and LSG on three aspects: social interaction (t=2.111, df=32, M diff=.594, p<.05), comfort interacting (t=2.243, df=32, M diff=.651, p<.05), and social cohesion (t=2.129, df=43, M diff=.650, p<.05). The HSG had a more positive reaction to the potential of CMC as a medium for social interaction, felt more comfortable interacting with other participants in the conference, and had a stronger feeling of being part of the online group. The variables are also associated with the concept of "social presence," or the degree to which a person is perceived as a "real person" in mediated communication (Short, Williams, and Christie 1976), which was found to be a significant predictor of learner satisfaction in the earlier study (Gunawardena and Zittle 1997).

Analysis of the third research question shown in Table 2, indicates a significant, positive correlation between CMC-related learning approaches and satisfaction (r = .44, p<.01). Eastmond

(1994) in describing the ADSCC model noted that many learning approaches relate specifically to the computer conferencing medium itself. The results of our study indicate that learners who felt more positively about their ability to adopt CMC-related learning approaches were more satisfied with their learning experience. These CMC-related learning approaches included their comfort level in actively contributing to the conference, participating in discussions, conversing through a text-based medium, introducing themselves online, using emoticons to communicate feelings, as well as their ability to form distinct individual impressions of virtual participants, and a sense of the online community. Many of the questionnaire items included in the CMC-related learning approaches scale are also associated with the concept of "social presence." The t-test results which investigated if there was a difference between the high and low satisfaction groups in relation to CMC-related learning approaches showed no significant difference.

In summarizing the results of the first three research questions, we observed that all three variables in the Eastmond (1994) ADSCC model were significantly related to learner satisfaction with an academic computer conference. Of the three variables, online features had the strongest positive relationship with satisfaction, indicating that if learners understood the unique features of the online learning environment they were more likely to be satisfied with the learning experience. This was followed by CMC-related learning approaches, which showed a moderately strong relationship with learner satisfaction. Learner readiness showed a moderate relationship with satisfaction. These results indicate that learners who are better prepared to function in the CMC environment, understand its unique features, and can adopt learning approaches suitable to the environment, will have more satisfying learning experiences. It is therefore important that designers of CMC learning experiences pay special attention to these factors, and orient adult learners to both the technical and social aspects of the medium. Feenberg and Bellman (1990) have

observed that "CMC is a sociotechnical system combining social and technical elements in a whole that is greater than the sum of its parts" (p. 68). Our results supported this view by showing the importance of both the technical and social aspects of CMC to learner satisfaction.

Research question four examined the intercorrelations between the three scales in the ADSCC model: learner readiness, online features, and CMC-related learning approaches, which are shown in Table 2. In examining the relationship between the scales, we found a statistically significant, high, positive correlation between the learner readiness scale and the CMC-related learning approaches scale ($r = .50$, $p<.01$). This means that learner readiness and CMC-related learning approaches are associated and vary together. Learner readiness which precedes the experiencing of online features is related to the learner's ability to develop learning strategy responses to function effectively in the online environment. Learners who are more ready, are better at developing and adopting strategies appropriate to the CMC learning environment. We also found a moderate, positive correlation between the online features scale and the CMC-related learning approaches scale ($r = .34$, $p<.05$). This means that learners who better understand the unique features of the online environment develop learning strategies to function effectively in this environment.

A finding of great interest to us is the negative or inverse relationship we observed (Table 2) between the learner readiness scale and the online features scale ($r = -.07$, $p=.649$). This relationship while not statistically significant, made us ponder about the reasons for an inverse relationship. This finding may indicate that learners who are well prepared and ready for the CMC learning experience (with prior technical experience, greater self-efficacy and a more positive attitude about the potential of the medium) will function well in the CMC environment even if they do not have a sound understanding of the unique features of the online medium. Learners who are

highly ready, may not be inhibited or intimidated by online features as learners who are less ready. Therefore, readiness appears to be an important factor to consider as we develop online learning environments. If learners are not ready for the CMC learning experience, then, more time should be spent on orienting them to the unique characteristics of the online environment. For these learners, both initial and on-going learner support may be necessary. The inverse relationship we observed between the learner readiness scale and the online features scale also made us critically reflect on the learner readiness scale. We felt that certain aspects of learner readiness may be missing from this scale and that we need to think of improving this scale by looking at learner readiness in a more comprehensive sense. We felt that in future research we should include items that measured learning styles, locus of control, critical thinking ability, self-direction, and other personality and motivation factors along with those directly associated with CMC readiness.

The fifth research question in our study was designed to test the predictive power of the Eastmond (1994) ADSCC model by examining which of the three independent variables: learner readiness; online features; and CMC-related learning approaches, could best predict the dependent variable, learner satisfaction with an academic computer conference. The linear multiple regression analysis employing the forced simultaneous method that was used to test the ADSCC model is reported in Table 3. The traditional alpha level of .05 was used to determine the level of significance. Table 3 shows that the three predictor variables: learner readiness, online features, and CMC-related learning approaches, resulted in a multiple R of .75, accounting for 56% of the known variance. This means that 56% of the variance in learner satisfaction is associated with the three variables: learner readiness, online features, and CMC-related learning approaches. In analyzing the variance shared by the three independent variables in the multiple regression analysis (Table 3) we find that online features is the best predictor of learner satisfaction, indicating that 28% of the

variance in learner satisfaction scores is uniquely associated with online features. In other words, controlling for learner readiness, and CMC-related learning approaches, online features share 28% of the variance in learner satisfaction with an academic computer conference. When examining the variance shared by the two other variables, we note that 6% of the variance in learner satisfaction is uniquely associated with learner readiness and this finding was statistically significant. Although not a significant result, 2% of the variance in learner satisfaction was uniquely associated with CMC-related learning approaches (Table 3). When considering the results of the regression analysis, we can argue that the adapted version of the Eastmond (1994) model is a fairly good predictor of learner satisfaction with an academic computer conference.

Insert Table 3 about here

The qualitative analysis of the sixth research question, addressed emerging learner profiles for the high satisfaction and low satisfaction groups. The three open-ended questions asked participants what they learned from the conference, what should be changed, and what should be retained. The responses from participants in the High Satisfaction Group to what they learned from the conference, tended to be more conceptual describing CMC as a method of "creating meaning and understanding through social interaction" and referred to the "sense of community" and "diversity of voices" as valuable learning experiences. The Low Satisfaction Group responses were more concrete in terms of learning about email, listservs, or distance education. Responses related to what to change or keep were similar across the two groups. The participants spoke of the need for organization of topics and threading of messages and the value of having a number of participants and sites for conferencing. An emerging profile for High Satisfaction learners showed

participants with a broader, more in-depth understanding of the computer conferencing experience coupled with the use of critical thinking and expressive writing skills. The Low Satisfaction learners displayed a narrower understanding of the conferencing experience which was focused on learning immediate skills such as how to use a listserv, and showed less evidence of critical thinking or expressive writing ability.

In reflecting on our analysis to test the model, we felt that one issue we need to examine very carefully is the interrelationship between the three major variables: learner readiness, online features, and CMC-related learning approaches. As we were developing the scales, we noticed a close relationship between the constructs online features and CMC-related learning approaches, and our data showed that there was a statistically significant relationship between these two scales (Table 2). However, we did not anticipate the stronger statistically significant relationship we found between learner readiness and CMC-related learning approaches (Table 2). We, therefore, recommend that future research should examine the interrelationships between the three variables in the ADSCC model, as well as the direction of the relationships. Future studies should test the model using techniques such as structural equations modeling and larger sample sizes. We also felt that the learner readiness scale should be improved to include factors that relate to individual differences in learning such as cognitive styles, learning styles, personality styles, and prior knowledge (Jonassen and Grabowski 1993). The inclusion of these factors would enhance the CMC-related learner readiness factors we tested in our analysis.

CONCLUSION

Using quantitative analysis, this study tested the Adult Distance Study Through Computer Conferencing (ADSCC) model developed by Eastmond (1994), to determine if learner readiness, online features, and CMC- related learning approaches are associated with learner satisfaction in academic computer conferences. All three variables showed a positive relationship to learner satisfaction. The strongest positive correlation was found between online features and learner satisfaction. The variable, online features, was also the best predictor of learner satisfaction. This has implications for designing computer conferences where attention must be paid to orienting adult learners to the unique elements that make up the computer conferencing environment. This includes the design of both the technical aspects and the social environment of an academic computer conference. As Harasim (1993) observes, "Networlds are the intersection of social and technical systems; design involves both technical and social considerations" (p. 29). This requires human effort to design and organize the technical system and facilitate the building of an online learning community. A well-trained moderator who can support both the technical and social aspects of a conference will be critical to the success of online learning experiences. When communication is mediated, technical training and sustained support are imperative (Anderson and Garrison 1998). Instructional designers must also pay attention to learner readiness factors such as pre-requisite knowledge, skills, and learner attitudes that will influence participation in virtual learning experiences. Learners who are more ready will be able to adopt CMC-related learning approaches to function effectively in the online environment.

As a conceptual framework, we found the adapted version of the Eastmond (1994) ADSCC Model to be a fairly robust predictor of learner satisfaction. The ADSCC model provides a useful

framework for understanding learner satisfaction by showing researchers how to categorize the different components that influence satisfaction. We anticipated interconnections between the three variables in the model, and our analysis confirmed a strong positive relationship between learner readiness and CMC-related learning approaches, and a moderate relationship between online features and CMC-related learning approaches. We feel that future research should carefully examine the interactions between the three variables in the model. We also believe that the ADSCC model (Eastmond, 1994) will also be a useful framework for examining learner achievement in computer conferences.

The profile that emerged for participants who were more satisfied with CC included the following characteristics: prior technical and conferencing skills; a broader and in-depth understanding of the potential and use of computer conferencing; more positive feelings toward the medium; a greater feeling of being a part of the online group; more comfort interacting with each other and the ability to articulately express oneself in writing. The less satisfied learners showed less experience technically, less comfort with the medium, and had less positive feelings toward the medium and the social cohesion of the online group. These participants were also less articulate in writing skills. While they had a basic knowledge of the use of computer conferencing, they did not fully understand the "big picture," nor, the benefits of participating in such an inter-university conferencing experience. It is of interest to note that in the demographic data discussed earlier, the Low Satisfaction Group had a higher percentage of participants who preferred to study alone (90%), compared to the High Satisfaction Group (69%). Those students who do not like interacting and collaborating with others when studying, may not appreciate the group nature of computer conferencing. Although all participants expressed general satisfaction with the conferencing experience, it is obvious that the degree of satisfaction is based on different levels of

strengths and needs that the learners bring to this experience. The profiles of the more satisfied and less satisfied learners that emerged from this study indicate the necessity for specific support systems such as technical training, and the creation of a socially comfortable environment, to make the conferencing experience more equitable and satisfying for all learners. Too often institutional resources are spent on acquiring sophisticated technical systems. It is important that equal emphasis and resources are spent on the human factors that support computer conferencing. Distance educators and instructional designers have a responsibility to recognize different learner profiles and design conferences to address these learner characteristics and needs.

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FIGURE 1

Adaptation of the Eastmond (1994) Adult Distance Study through Computer Conferencing (ADSCC) Model

LEARNER READINESS	ONLINE FEATURES	CMC-RELATED LEARNING APPROACHES
Prior e-mail experience (#1) Prior listserv experience (#2) Prior comfort with CMC (#3) Adequate technical training at site (#4) Self-efficacy in mastering the CMC system (#5) Belief in CMC's potential for distance education (#8) Belief in the medium's capacity for academic discussion (#9)	CMC as a medium for social interaction (#10) Comfort interacting with online participants (#19) Social cohesion of the online group (#42) Point of view acknowledged (#22) Listserv's capability to facilitate discussion (#37) Barriers due to technical problems (#46) Barriers due to access (#47)	Actively contributing to the conference (#38) Comfort participating in discussions (#16) Comfort conversing through text-based medium (#13) Comfort introducing self in CMC (#14) Forming a sense of online community through introductions (#15) Ability to form distinct impressions of participants (#41) Using emoticons to communicate feelings (#49)

Note: The numbers in parentheses correspond to the questionnaire item number.

FIGURE 2
Learner Satisfaction scale items

Able to learn through the medium of CMC (#11)
Able to learn from the discussions (#12)
Stimulated to do additional reading or research on topics discussed (#24)
Learned to value other points of view (#25)
Would like to participate in another computer conference (#50)
Useful learning experience (#51)
Enhance face-to-face on-campus courses (#52)
Made acquaintances electronically in other parts of country/world (#40)
Diversity of topics prompted participation in discussions (#39)
Put in great deal of effort to learn CMC system to participate (#6)

Note: The numbers in parentheses correspond to the items on the questionnaire.

TABLE 1

Reliability summary of variable scales: Learner Readiness, Online Features, Learning Approaches, and Learner Satisfaction

Variable Scale	Number of Items	Mean	Variance	Std. Deviation.	Cronbach's (α)
Learner Readiness	7	23.78	35.56	5.96	.72
Online Features	7	22.04	40.16	6.34	.78
Learning Approaches	7	24.10	42.87	6.55	.84
Learner Satisfaction	10	35.02	69.73	8.35	.85

N=50

TABLE 2

Pearson Product Moment Correlation: Learner Readiness, Online Features, Learning Approaches, and Learner Satisfaction

	Learner Readiness	Online Features	Learning Approaches	Learner Satisfaction
Learner Readiness	----	-0.07	0.50**	0.27*
Online Features		----	0.34*	0.59**
Learning Approaches			----	0.44**
Learner Satisfaction				----

N =50; *$p \leq 0.05$; **$p \leq 0.01$ Correlation, 2-tailed Significance Level

TABLE 3

Multiple regression analysis: Learner Readiness, Online Features, Learning Approaches, and Learner Satisfaction

Step Number 1, Multiple Regression Analysis, Forced Simultaneous Method

Multiple *R*	0.75
*R*_	0.56
Adjusted *R*_	0.52
Standard Error	0.51

Analysis of Variance

	df	Sum of Squares	Mean Square	*F*-value	Sig *F*
Regression	3	12.13	4.04	15.45	<.0005
Residual	37	9.69	0.26		

Variables in the Equation

	β	SEβ	Beta	*F*-value	Sig.*F*
Variables					
Learner Readiness	0.24	0.11	0.28	4.80	0.035
Online Features	0.56	0.12	0.60	22.98	<.005
Learning Approaches	0.19	0.15	0.18	1.67	0.204
(Constant)	0.21	0.53		.16	0.691

Variance Shared by the Three Independent Variables

	Variance Shared	Sum of Squares	*df*	Mean Square	*F* value	*p*
Learner Readiness	0.06	1.26	1	1.26	4.80	0.035
Online Features	0.28	6.02	1	6.02	22.98	0.000
Learning Approaches	0.02	.44	1	.44	1.76	0.204

N=41

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